Fairgreen Energy Storage Project

Acoustic Impact Assessment

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Contents

Revision History

Issue	Date	Name	Latest Changes	File References
01	01/05/2025	Stuart Hill	First Version	05560-9783639 05560-10232630

1 Introduction

This report provides an acoustic assessment of the proposed Fairgreen Battery Energy Storage System (BESS), referred to as the 'Proposed Development' herein, in terms of operational impacts. Two Members of the Institute of Acoustics have been involved in its production and details of their experience and qualifications can be found in **Appendix A**.

An assessment of the noise generated by the equipment to be installed as part of the Proposed Development has been undertaken in accordance with BS 4142:2014+A1:2019 '*Methods for Rating and Assessing Industrial & Commercial Sound*'.

2 Planning Policy, Guidance & Standards

2.1 National Planning Policy Framework (NPPF)

The treatment of noise is defined in the context of planning by the National Planning Policy Framework (NPPF) [1] which details the Government's planning policies and how these are expected to be applied. The NPPF provides advice on the role of the planning system in helping to prevent and limit potential adverse effects of noise, stating that planning policies and decisions should aim to avoid noise giving rise to significant adverse impacts, whilst at the same time mitigating and reducing other adverse impacts on health and quality of life to a minimum. The NPPF refers to the Noise Policy Statement for England (NPSE) which provides guidance on the categorisation of impact levels.

2.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) [2] sets out the long-term vision of Government noise policy which is to '… promote good health and quality of life through effective noise management within the context of sustainable development'. In order to weigh noise impacts against the economic and social benefits of the activity under consideration, the NPSE defines three categories of effect levels:

- No Observed Effect Level (NOEL) - noise levels below this have no detectable effect on health and quality of life;
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and,
- Significant Observed Adverse Effect Level (SOAEL) - the level above which effects on health and quality of life become significant.

2.3 National Planning Practice Guidance (NPPG): Noise

National Planning Practice Guidance (NPPG) [3] on noise puts the effect levels defined by the NPSE into greater context by explaining how such noise levels might be perceived, providing examples of outcomes based on likely average response, and advising on appropriate actions. These are reproduced at **Table 1**.

Table 1 - Noise Exposure Hierarchy

Response	Examples of Outcomes	Increasing Effect Level	Action
	No Observed Effect Level (NOEL)		
Not present	No Effect	No Observed Effect	No specific measures required
	No Observed Adverse Effect Level (NOAEL)		
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level (LOAEL)		
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level (SOAEL)		
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

In addition to this guidance, which is applicable to all forms of environmental noise, specific guidance relating to nationally significant energy infrastructure has been published by the Department for Energy Security & Net Zero (DESNZ). Whilst the proposed development is not of a scale that would be deemed nationally significant, the relevant National Policy Statements (NPS) are informative in that they suggest an assessment methodology that would be considered appropriate for the type of development being proposed.

2.4 The Overarching National Policy Statement for Energy (EN-1)

The Overarching National Policy Statement for Energy (EN-1) [4] outlines the need for new electricity capacity from renewable sources as the country transitions to a low carbon electricity system. However, when referring to the NPSE, EN-1 recognises the potential for energy infrastructure to impact on health and quality of life if it results in excessive noise and goes on to state that where noise impacts are likely to arise, they should be assessed according to the principles of the relevant British Standards. Of the examples provided, the standards BS 4142 and BS 8233 (discussed below) relate to operational sound/noise.

2.5 National Policy Statement for Renewable Energy Infrastructure (EN-3)

The National Policy Statement for Renewable Energy Infrastructure (EN-3) [5] refers back to EN-1 for the purposes of addressing noise impacts from renewable energy development on sensitive locations and provides general advice as to potential mitigation measures in specific instances.

2.6 The National Policy Statement for Electricity Networks Infrastructure (EN-5)

The National Policy Statement for Electricity Networks Infrastructure (EN-5) [6], relevant to the transmission and distribution parts of the electricity network along with any associated infrastructure, such as substations and converter stations, again points to the appropriateness of BS 4142 (discussed at **Section 2.7**) in assessing the operational acoustic impact of such projects.

2.7 BS 4142 Methods for Rating and Assessing Industrial & Commercial Sound

BS 4142 [7] describes methods for rating and assessing sound of an industrial or commercial nature. Outdoor sound levels are used to assess the likely effects on people who might be inside or outside a residential property via the comparison of the pre-existing background sound levels with the predicted/modelled sound associated with the introduction of a particular development, known as the 'rating' level, which also accounts for any distinguishing characteristics of the emitted sound.

To determine a value for the background sound level at a specific assessment point, a series of measurements are made at a location at, or representative of, a dwelling or receptor of interest. The standard requires that that the background sound measurements (dB $L_{A90,\,T}$ - the sound level exceeded for 90% of the time, or the lowest 10 % of sound, for the reference time period, T) should be measured during times when the sound source in question could or will be operating and that the individual measurement intervals should not normally be less than 15-minuites in length. The objective is then to determine a justifiable representative background sound level for time periods of interest via statistical analysis and/or observations of the data set collected. The standard states that the representative background sound level '… should not automatically be assumed to be either the minimum or modal value'.

The 'rating' level is defined as the 'specific' sound level (dB L_{Aeq} – the average sound level) plus any adjustment for the characteristic features of the sound generated by the source in question. In instances where the source is unlikely to have a specific character at the assessment location then the 'rating' level can be assumed to equal to the 'specific' sound level. Where tones are present a correction of 2 to 6 dB can be added to the 'specific' sound level to determine the 'rating' level and further adjustments may be added where the source has other applicable characteristics.

The defined representative background sound level(s) and rating level(s) are then compared to determine the possible impact but with consideration of the context in which the industrial or commercial sound source to be introduced presents itself in respect of other sound sources and the existing character of the area. **Table 2** provides a summary of expected impacts when comparing background and rating levels.

Table 2 – BS 4142 Assessment Criteria

Rating Level	BS 4142 Assessment Criteria
Equal to or below background	'…an indication of the specific sound source having a low impact, depending on the context'.
Approximately +5 dB greater than the background sound level	'…an indication of an adverse impact, depending on the context'.
Approximately +10 dB or more greater than the background sound level	'…an indication of a significant adverse impact, depending on the context'.

Further to the above, it may not be appropriate or proportionate to undertake a full assessment in accordance with the BS 4142 standard, particularly when the sound level associated with the new source is particularly low at neighbouring receptors and/or is expected to be much lower than the existing background sound levels. The previous version of BS 4142 [8] stated that this version of the standard is not appropriate for use in instances where background and rating levels are very low and that '… background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low'.

2.8 Consultation with Basildon Borough Council

Basildon Borough Council (BBC) have been consulted to ensure that this acoustic assessment meets their requirements. RES and BBC agreed the following:

- RES sent an email to BBC, dated 26th March 2025, detailing the proposed methodology for the Proposed Development. The proposed methodology stated that the operational effects of the Proposed Development on neighbouring receptors would be assessed through a full Acoustic Assessment, which would be completed in accordance with BS 4142+A1:2019 '*Methods for rating and assessing industrial and commercial sound*'. It was proposed to use the existing background sound data from sound surveys undertaken as part of information supporting various other planning applications in the area, therefore scoping out the requirement for background sound monitoring for the Proposed Development. It was stated that there would likely be some temporary sound generated during the construction phase of the development, largely associated with site activities and vehicle movements, however, it was stated that this can be controlled to a suitable level via a final Construction Environmental Management Plan (CEMP) if considered necessary. RES sought advice

from BBC to determine if there were any nearby developments in planning, consented or under construction that should be included in a cumulative assessment.

- BBC responded by email on 7th April 2025 acknowledging receipt of the email from RES and confirmed acceptance of RES' proposed methodology for the BESS site. BBC confirmed that they were not aware of any other recent nearby sensitive developments, but that there was a proposal for residential properties (Planning Ref. No. 24/01473/SCOPE). Furthermore BBC requested that any low frequency or other characteristics were suitably mitigated within RES' recommendations.

3 Baseline Environment

3.1 Existing Sources of Sound

The current sound environment at properties surrounding the site is typically dominated by sound from the high volumes of traffic along the A127 - Southend Arterial Road, the A130/A1245 – Canvey Way, the Rayleigh Spur Roundabout and the Fairglen Interchange. Other sources relate to the operations at the surrounding commercial facilities, aircraft overhead and sporadic vehicle movements along other local roads plus localised human activities.

The findings of sound surveys undertaken as part of information supporting various other BESS and solar planning applications in the area, have been used to inform the assessment provided herein. This approach has been accepted by BBC as stated in Section 2.8.

3.2 Sensitive Receptors

A list of the residential assessment locations considered representative of those located closest to the Proposed Development is provided in **Table 3** as also shown in **Figure 1, Section 5**.

Table 3 – Sensitive Receptors / Assessment Locations

House Name	ID	Co-ordinates	
		Easting	Northing
4 Bonville Farm Cottage	H01	577287	190716
Annwood Lodge	H02	577831	190855
Oak Farm	H03	578140	190637
Janda Field	H04	578024	190240
Copperfield Stables	H05	577916	190107
Bonvilles Farm	H06	577208	190488

3.3 Existing Sound Levels

A number of surveys of the existing ambient (dB L_{Aeq}) and background (dB L_{A90}) sound levels at locations in the vicinity of the Proposed Development have been undertaken in support of planning applications for neighbouring BESS and solar developments on land to the north and east of the Proposed Development.

Analysis of the noise impact assessments was undertaken to establish the most representative survey locations which were relevant to the Proposed Development. From each of the noise impact assessments, it was conclusive that the existing sound environment at the nearest residential receptors is dominated by road traffic noise. This will be the same for the Proposed Development, as the current sound environment at properties surrounding the site is typically dominated by sound from the high volumes of traffic along the A127 - Southend Arterial Road, the A130/A1245 – Canvey Way, the Rayleigh Spur Roundabout and the Fairglen Interchange. Therefore, the existing baseline sound data would be considered representative of the properties that will be considered in this assessment. BBC confirmed their acceptance of this methodology. The sites considered for the existing baseline sound data were:

- Site A - Rayleigh BESS (Fairlawns Farm) – Planning Ref: 24/00455/FUL. Located approximately 200m northeast of the Proposed Development [9];
- Site B - Dollymans BESS – Planning Ref: 21/00522/FUL. Located approximately 950m north of the Proposed Development [10]; and
- Site C - Rayleigh Solar Farm – Planning Ref: 22/00175/FUL. Located approximately 950m northeast of the Proposed Development [11].

The background and ambient sound levels for the two closest monitoring locations for the Site A application, are shown in **Table 4** and **Figure 1** below. For the purpose of this assessment, monitoring locations ML1 and ML2 are considered the most representative of the existing sound environment at each of the identified receptors, due to their location in relation to the Proposed Development. Therefore, the measured background sound levels from ML1 and ML2 will be used to inform the assessment. The monitoring locations for Site B and Site C did provide comparable background sound levels but due to their greater distance from the Proposed Development were deemed to be less representative of the sound environment for the nearest receptors in the vicinity.

Table 4 - Adopted Background & Ambient Sound Levels

Site	ID	Background Sound Level, dB L_{A90}		Ambient Sound Level, dB L_{Aeq}	
		Daytime	Night-time	Daytime	Night-time
A	ML1	58	45	63	62
A	ML2	48	40	57	53

4 Predictions

A model of the battery storage facilities and the surroundings has been developed using CadnaA[1] sound modelling software. The ISO 9613-2 [12] sound propagation/prediction methodology has been employed to predict the specific sound levels resulting from the development at nearby residential properties, incorporating various assumptions and factors which are considered appropriate for use here:

[1] https://www.datakustik.com/

- The plant to be installed as part of the development has been modelled as point sources and these are assumed to be operating at their maximum potential output for all time periods as a conservative basis of assessment;
- Mixed ground conditions have been assumed (i.e. G=0.5) as representative of the land surrounding the Proposed Development. The ISO 9613-2 standard allows for a range of ground conditions to be applied, from porous ground conditions (G=1), which includes surfaces suitable for the growth of vegetation (i.e. farmland), to hard ground (G=0), such as paving, water and concrete;
- The receptors have been assigned a height of 1.5 m;
- Atmospheric attenuation corresponding to a temperature and relative humidity of 10 °C and 70 % respectively, as defined within ISO 9613-1 [13], which represents relatively low levels of sound absorption in the atmosphere;
- The topography of the site and surroundings has also been included within the sound model.

ISO 9613-2 is a downwind propagation model. Where conditions less favourable to sound propagation occur, such as when the assessment locations are upwind of the Proposed Development, the sound levels would be expected to be less and the downwind predictions presented as part of this report would be regarded as conservative, i.e. greater than those likely to be experienced in practice.

The predominant sources of sound to be introduced as part of the Proposed Development are the 42 inverters (INV), 43 transformers (TRA), 168 battery storage containers (BESS) and 2 substation transformers (Sub_Tx).

The site has been designed on an iterative basis with a view to minimising, as far as practicably possible, the projected operational noise levels with due regard to the relative sensitivity of neighbouring premises and all other site constraints.

The assumed sound power data for the equipment to be installed as part of the Proposed Development are provided at **Table 5**. The overall levels correspond to the maximum expected sound output for each of the respective plant that will be available at the time of potential procurement/installation, should the site be granted planning consent, and as advised by candidate manufacturers.

Table 5 - Overall Sound Power Levels, dB L_{WA}

Equipment & ID	Sound Power Level, dB L_{WA}
BESS	72
INV	80
TRA	75
Sub_Tx	93

The sound emitted by the various equipment to be introduced as part of the Proposed Development can have a tonal character that is just perceptible (i.e. a whine, whistle or hum). Under the subjective method described in BS 4142, a correction of 2 dB has been applied to account for this feature. However, the assessed specific and rating levels detailed in **Section 5** are low and potential tonal noise in the sound emitted from the various plant may well be masked by existing sources of sound in the area.

The results of the predictions at the various residences surrounding the Proposed Development are shown at **Section 5**.

5 Assessment

The predicted specific sound and corresponding rating levels (i.e. including for a 2 dB penalty for tonal noise) at the potentially sensitive properties located nearest to the Proposed Development, for daytime and night-time periods respectively, are shown in **Table 6**. The rating level is compared to the background sound levels detailed in **Section 3.3** to provide the associated impact.

The resultant impact is described as 'negligible' if the rating level is more than 10 dB below the background sound level; 'low' if the rating level is less than or equal to the background sound level; 'minor' if not more than 5 dB above; 'moderate' if not more than 10 dB above and major if more than 10 dB above. These criteria compare to the categories defined by the NPSE, with rating levels less than or equal to background sound level representing the NOEL, 5 dB above background representing the LOAEL and 10 dB above background the SOAEL.

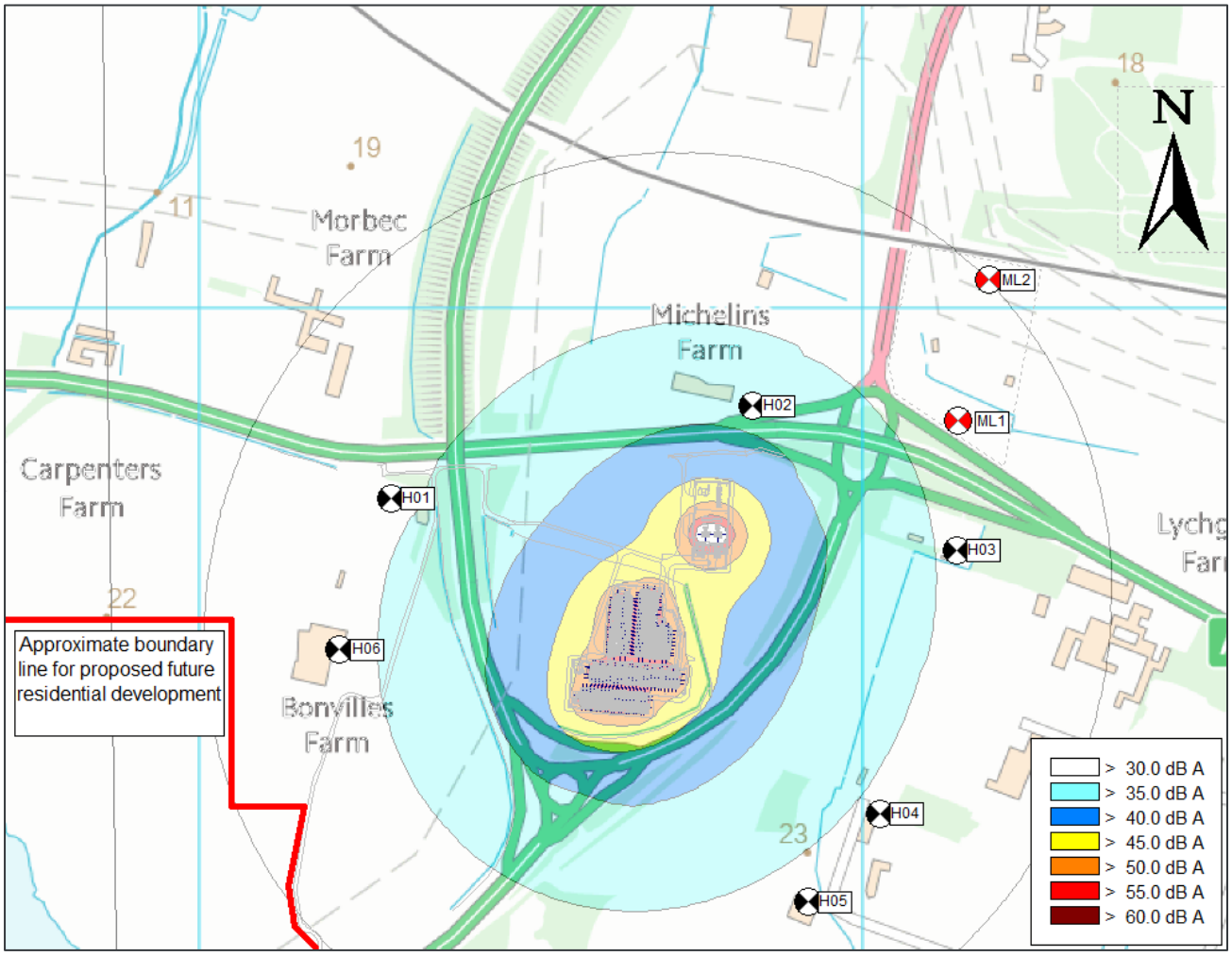
Table 6 - BS 4142 Assessment

House ID	Specific Level, dB L_{Aeq}	Rating Level, dB L_{Ar}	Background Level, dB L_{A90}	L_{Ar} - L_{A90}, dB	Potential Impact
			Daytime		
H01	34	36	58	-22	Negligible
H02	38	40	58	-18	Negligible
H03	34	36	58	-22	Negligible
H04	34	36	48	-12	Negligible
H05	34	36	48	-12	Negligible
H06	34	36	48	-12	Negligible
			Night-time		
H01	34	36	45	-9	Low
H02	38	40	45	-5	Low
H03	34	36	45	-9	Low
H04	34	36	40	-4	Low
H05	34	36	40	-4	Low
H06	34	36	40	-4	Low

The assessment indicates that the predicted noise impact from the Proposed Development at the nearest neighbouring properties is negligible for daytime and low for night-time periods. Existing adopted ambient (dB L_{Aeq}) sound levels at each of the monitoring locations (see **Section 3.3**) are also well above the predicted rating levels associated with the operation of the Proposed Development which will serve to provide substantial masking of operational noise should the site become operational.

An illustrative sound footprint for the proposed development showing the predicted specific sound level (dB L_{Aeq}) is provided in **Figure 1**. The background sound survey locations referred to above are marked in red.

Figure 1 – Specific Sound Level Contour Plot, dB L_{Aeq}



Overall, in this context and based on the sound modelling assumptions and assessment results presented, the sound emitted by the Proposed Development can be considered 'not present' in terms of government policy and guidance provided within the NPSE & NPPG (see **Sections 2.2 & 2.3** respectively). This corresponds to the 'No Observed Effect Level' (NOEL) and no further specific action, over and above that already considered, is required to further mitigate operational noise associated with the introduction of the site.

Apart from the tonal character that may be just perceptible and is accounted for with the 2 dB penalty as described previously, it is predicted that there will be no impact from low frequency noise (LFN) or other characteristics from the operation of the Proposed Development at the nearest receptors. From analysis of the predicted third-octave band specific sound levels at the nearest receptor it is determined that there is no predominant low frequency tonal noise at the nearest receptors and therefore no mitigation will be required due to this.

It should be noted that the planned future residential properties (Planning Ref. No. 24/01473/SCOPE) as identified by BBC, are located to the southwest of Bonvilles Farm as identified by the indicative approximate red line boundary in **Figure 1**. These proposed future properties will be further from the Proposed Development than Bonvilles Farm, therefore, the predicted sound levels at these properties will be less than those at Bonvilles Farm. Therefore, the noise levels resulting from the operation of the site will be low in the context of relevant assessment criteria (i.e. BS 4142) and can be considered 'not present'.

The wording for a suggested planning condition, that would restrict noise associated with the introduction of the Proposed Development should the site gain planning consent, is provided in **Appendix B**.

6 Conclusions

An acoustic impact assessment of the proposed Fairgreen Energy Storage Project has been undertaken. The results show that noise levels resulting from the operation of the site will be low in the context of relevant assessment criteria (i.e. BS 4142) and can be considered 'not present' in terms of government policy and guidance provided within the NPSE & NPPG.

7 References

[1] Department for Levelling Up, Housing and Communities (September 2023) National Planning Policy Framework

[2] Department for Environment, Food and Rural Affairs (March 2010) Noise Policy Statement for England

[3] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (July 2019) National Planning Practice Guidance: Noise

[4] Department for Energy Security & Net Zero (November 2023) Overarching National Policy Statement for Energy (EN-1)

[5] Department for Energy Security & Net Zero (November 2023) National Policy Statement for Renewable Energy Infrastructure (EN-3)

[6] Department for Energy Security & Net Zero (November 2023) National Policy Statement for Electricity Networks Infrastructure (EN-5)

[7] British Standards Institution (2019) BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

[8] British Standards Institution (1997) BS 4142:1997 Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

[9] Noise Impact Assessment, BESS Rayleigh. Prepared for Gresham House Devco Pipeline by RSK Acoustics (June 2024). Submitted to Rochford District Council as part of planning application 24/00455/FUL.

[10] Noise Assessment for Battery Storage Facility – National Grid Station, Rayleigh, Essex. Prepared for Statera Energy Limited by RPS (April 2021). Submitted to Rochford District Council as part of planning application 21/00522/FUL.

[11] Noise Impact Assessment for Solar Farm Development at Land West of Rayleigh Substation, Rayleigh, Essex. Prepared for Aura Power Solar Ltd by Noise & Vibration Consultants Ltd (January 2021). Submitted to Rochford District Council as part of planning application 22/00175/FUL.

[12] International Organisation for Standardisation (Edition 2, 2024) ISO 9613-2:2024 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors.

[13] International Organisation for Standardisation (June 1993) ISO 9613-1:1993 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 1: Calculation of the Absorption of Sound by the Atmosphere.

Appendix A – Experience & Qualifications

Table A.1 - Author

Name	Stuart Hill
Experience	Senior Acoustic Specialist, Renewable Energy Systems (RES), 2024-Present Senior Acoustic Consultant, Mabbett, 2022-2024 Senior Environmentalist (Acoustics), Amey, 2021-2022 Associate Consultant – Acoustics, Noise & Vibration, SLR Consulting, 2017-2020 Technical Analyst/Senior Acoustic Analyst, RES, 2013-2017
Qualifications	MIOA, Member of the Institute of Acoustics MInstP, Member of the Institute of Physics MSc Principles and Applications of Radiation in Industry, the Environment and Medicine, University of St Andrews BEng Electronics Engineering, University of Aberdeen

Table A.2 - Checker

Name	Peter Brooks
Experience	Acoustic Lead, Renewable Energy Systems (RES), 2023-Present Senior Acoustic Analyst, RES, 2022-2023 Acoustic Consultant, Arcus Consultancy Services, 2021-2022 Director, 343 Acoustics, 2019–2021 Lead Acoustic Engineer, Tymphany, 2017-2019 Research and Development Engineer, SEAS Fabrikker, 2014-2017 Acoustic Engineer, Premium Sound Solutions, 2011-2013
Qualifications	MIOA, Member of the Institute of Acoustics PgCert Environmental Acoustics, University of Salford BSc (Hons) Audio Technology, University of Salford

Table A.3 - Approver

Name	Karen Anne Hutton
Experience	Technical Director, Renewable Energy Systems (RES), 2023–Present Head of Repowering & Life Extension, RES, 2019-2023 Head of Innovation & Optimisation, RES, 2018-2019 Transformation Manager, RES, 2016-2018 Initiatives Manager, RES, 2015-2016 Prospecting & Development Data Manager, RES, 2012-2015 Technical Manager, RES, 2009-2012 Senior Wind Analyst, RES, 2007-2009 Wind Analyst, RES, 2001-2007
Qualifications	MEng Civil Engineering, Heriot-Watt University

Appendix B – Suggested Planning Condition Wording

The energy storage project shall be designed and operated to ensure that the rating sound level, determined using the BS 4142:2014 methodology external to any existing residential properties, shall not exceed 40 dB L_{Ar} or the background sound level plus 5 dB for daytime and night-time periods, whichever is the greater.